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## REPORT

# Technology assessment – thinking with values

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The 4<sup>th</sup> European Technology Assessment Conference “Value-driven Technologies: Methods, Limits, and Prospects for Governing Innovations” was hosted by the Slovak Academy of Sciences in Bratislava. The Slovakian colleagues continued the tradition of the European TA Conferences: What luck! The Slovak Republic is one of the countries, which is in the process of establishing technology assessment (TA). Putting values at the core of the conference helped to fruitfully discuss current concepts, technical trends, and their specific relevance for technology assessment and related scientific activities in the field of knowledge-based policy-making in science, technology and innovation. Questioning the values for and behind TA served as an overall frame for keynotes, sessions and discussions.

Three keynotes by P. Sykora (University of Sts. Cyril, Trnava) on Health Technology Assessment, C. Müller-Birn (Freie Universität Berlin) on Artificial Intelligence and G. Meskens (Belgian Nuclear Research Centre & Ghent University) on Social Justice gave impulses and showed multiple perspectives and approaches on values in TA. With 184 participants from 29 countries, the conference was well attended, with many young scientists taking and interest in TA.

## Role concepts in TA and Responsible Innovation

A. Grunwald (ITAS Karlsruhe) initiated and moderated together with R. von Schomberg (European Commission) the opening plenary session on role concepts accompanying conceptual discussions in TA and Responsible Research and Innovation (RRI). In particular, the tension between being a distant and neutral advisor, and an active and transformative actor shaping technology governance, was subject of an engaged plenary debate. In the session, previous discussions from both neighboring fields (TA and RRI) were recalled and scrutinized with respect to current challenges of TA. Presentations by H. Torgersen (ITA Vienna), Chr. Wittrock (Oslo Metropolitan University) and R. von Schomberg addressed issues of neutrality and independence of TA, drivers and influencing factors in RRI, and the role of TA and RRI in European innovation policy. Plenary discussion focused on specific role concepts of TA and RRI as well as their different institutional and political settings, thereby emphasizing the strong need for contextualization in this respect.

However, which developments can be considered really “new” for TA in terms of methods? The session “New Methods for TA” explored the potentials and challenges of quantitative computational content analysis. T. Sinozic (ITA) reported about the development and testing of a text mining methodology to extract policy recommendations from large amounts of evidence on European neighborhood policy. Taking the example of climate engineering, N. Matzner (University Klagenfurt) highlighted the capabilities of the programming language “R” to support the analysis of scientific networks. L. Capari and T. Udrea (ITA) demonstrated text-mining approaches, specifically word occurrence networks and topic modelling. In the concluding joint discussion, the presenters agreed on the potential of new digital methods to enrich the methodological portfolio of TA, when applied reflectively and in addition, rather than substitution, to other e. g. qualitative methods.

## Limits and prospects for governing innovations

There is hardly any other field in TA where the limits and perspectives for innovations are as impressive as in assistive technologies (ATs). The session “Assessing similarities and gaps in ageing and disabilities: towards better assistive technologies” focused on specific dimensions of technologies for the elderly and people with disabilities. Seen from the perspective of TA, there are obstacles of fair and equal access to technological devices, e. g. due to costs, or the lack of a user-centered choice. Further, the role of health professionals was seen as a duality with possible relevance for further discussion within the TA context. This fruitful discussion was stimulated by presentations from L. Nierling and B. Krings (ITAS), M. Baumann and M. Maia (ITAS), E. Thorstensen (OsloMet), B. Schiffhauer and D. Schneider (Fachhochschule Bielefeld).

Another instructive example for the limits and prospects of governing processes are the impacts of digitalisation, artificial intelligence (AI) and big data on research. AI might challenge individual autonomy and skills of researchers as well as scien-

tific validity of AI-augmented research. Whether this change is disruptive or not with respect to established research cultures was discussed with panellists B. Humm (Darmstadt University), M. Nentwich (ITA), J. C. Schmidt (Darmstadt University) and S. Spiekermann (WU Vienna). The session chair S. Lingner (IQIB, Germany) summarized that AI should be regarded as a research tool. In this function, it can improve efficiency in science, open up new options and applications in research and might support the finding and formulation of new hypotheses and theories. AI's "black box" characteristic might challenge the established falsification mode of modern research. Therefore, it might tackle overall trust in AI-augmented research. This point might lead to a paradigm shift of late modern research from an explanatory to a predictive mode of research.

The governing implications of demographic change and its connections with the fourth industrial revolution was discussed: What is the role of the ageing and wealthy consumer? This was the topic covered by C. Seibt (University Kassel). U. Bechtold (ITA) identified a series of challenges in future work settings connected with both an ageing society and smart factories and questioned to what extent an organizational "top-down" view on these developments needs to be critically examined. K. Zimmermann and I. Hegny (Austrian Federal Ministry for Transport, Innovation and Technology) provided an overview on global technology trends for AT. They also presented lessons learned and their impact on the ministry's policy and funding interventions. M. Barland (NBT, Norway) outlined education policy and lifelong learning as one of the key governance areas at interface between ageing and technology to improve flexibility, personalization and the possibility of learning in simulated environments.

Another focus was on the governance of food waste reduction. T. Ratering and L. Heřáková (Technology Centre of the Czech Academy of Sciences) presented strategies for food waste reduction in public catering. As globally one third of produced food is lost, food waste reduction requires information for consumers, responsibility of producers, and a new "social contract-agreement". B. Kebová (Zachraň Jídlo, SAVE FOOD) presented how NGOs deal with the issue of food waste and some solutions in the food value chain, including awareness building of consumers and using new technologies for food tracking that might reduce problems. M. Sotoudeh, S. Bettin, N. Gudowsky (ITA) presented the need for comprehensive solutions instead of fragmented policies and the need for critical evaluation of values behind visions on digitalization for food security from farm to grocery and landfill.

### Value-driven technologies – how to give advice?

Values inscribed in new technologies are a relevant subject for TA. TA studies also reflect on the role of those deciding about and using new technologies (e. g. policy makers). The Dutch colleagues practiced a very innovative session format. First, the panellists M. Barland (NBT), Chr. Taylor (STeAPP), T. Jetzke (VDI/VDE), N. Tobler (TA Swiss), J. Loveridge (Harvard Uni-

versity) and M. Nentwich (ITA) discussed under the direction of I. van Keulen (Rathenau Institute) "How to serve Parliament as a TA institute?". The second part of the session was used for a so-called peer coaching. Anyone with a question on how to serve parliament could ask it to the panel via an app. These questions were projected onto the wall in real time; the method made the discussion very lively by continuously giving new impacts.

The increasing use of computer models and simulations to support policy formulation, implementation and evaluation point to the crucial role of TA in this area. P. Lopez (University of Vienna), A. Mager (ITA) and F. Fischer (TU Vienna), F. Eyert (Weizenbaum Institute for the Networked Society, Berlin) and

## *Values inscribed in new technologies are a relevant subject for TA.*

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D. Fuchs (ITA) showed how the recent predictive model of the Austrian employment service agency includes technical and societal biases that codify past inequalities. It was discussed what the consequences of this model are (emphasizing efficient labor market management while framing unemployment under neoliberal austerity policies at the same time) and how the diffusion of computational modelling has led to epistemic shifts.

The increasing use of AI is a key characteristic of digital transformation that is profoundly changing modern society. The aim of the session "Artificial Intelligence and the Future of Work and Education" was to discuss suitable policy responses that can help to prepare for the upcoming digital future. The presentations (M. Pazour and M. Fatun (Technology Centre of the Czech Academy of Sciences), C. Mader (Technology and Society Laboratory Empa, Zurich) and K. Braun (University of Stuttgart)) outlined the main issues related to the digital transformation from different angles, however, all of them ended up by pointing to the critical need for empowering society with new skills and competencies.

„Methods, Limits, and Prospects for Governing Innovations“ were presented by G. Bianchi, M. Popper and T. Michalek (Slovak Academy of Sciences) on different attitudes to progressive gene therapies in Slovakia in the light of the ethical dimensions of human enhancement. A. Lang (IHS Vienna) presented experiences with governing genome editing and theories for dealing with 'wicked' problems. E. Haslinger-Baumann (University of Applied Science Vienna) emphasized the need for inclusion of clients and their family in quality assurance in 24h-caregiving at home by means of digital support. Co-Creation of Co-design plays a crucial role in expectations and concerns of the "Care Robot for Seniors" presented by P. D. Hos (University of Stuttgart) and "Technologies for older adults" presented by W. Rowan, S. McCarthy and C. Fitzgerald (University College Cork).

### Education matters!

Questions how to communicate within and over TA run like a red thread through the conference. The discussions about value-driven technologies repeatedly showed that values could only serve as a point of reference for the evaluation of technologies if these are constantly renegotiated. The question arises how education and training can be developed to open up these reflective competences for students, but also technical professionals. “TA and Ethics for Value-driven Technologies: Educational Aspects” reflected on the perspectives of TA education as such and discussed formats how TA as a value-oriented approach can be integrated into technical education reflecting on the interactions over TA within diverse communities of scientists, technologists and engineers. The representatives of different national

Monospecific Forests in Southwest Germany” (I. Almeida, Chr. Rösch and S. Saha, ITAS) demonstrated that a global dimension is needed in order to develop meaningful national comparisons, but also in order to approach the analysis of common future challenges on equal footing. The foundation of the globalTA network during the conference was an important step in this direction.

Under the perspective of organizational options, “Platform work” represents a global phenomenon with specific national strategies and impacts as it profoundly challenges traditional forms of organized labor and existing social welfare models. The session ranged from a case perspective of digital labor from Serbia by B. Andjelkovic (Public Policy Research Centre) over to a comparative perspective on recent developments of crowd

## *TA education needs to be self-reflective.*

education systems (J. Kaźmierczak (Silesian University of Technology), E. Gavrilina and A. Kazakova (Bauman Moscow State Technical University), J. Sośnicka (Lodz University of Technology), R. Dürr (Karlsruhe Institute of Technology), E. Yadova (Moscow Business School) and K. Weber (OTH Regensburg)) touched upon methodological and organizational issues.

Further, they shared practical experiences, e. g. a dynamic balance between conceptual and practice-oriented teaching, discussed the advantages of teaching TA at different stages of education, including TA courses for educators themselves. The joint agreement was that a TA education needs to be self-reflective, explicating its contributions from different disciplines as well as its interdisciplinary approach. B. Gładysz (Warsaw University of Technology), J. Kaźmierczak, N. Malinovskaya and P. Malinovskii (National Research University) and A. Andreev (Moscow Power Engineering Institute) described needs to deal with social challenges and obstacles for interdisciplinary education. Requirements for teaching the teachers for value-driven technologies was discussed by M. Sotoudeh (ITA) to support future engineers to design technical innovations dealing with societal challenge.

### Impacts of (new) technologies worldwide

„International TA perspectives“ with cases from India, South Korea (M. Choi, Korea Institute of S & T Evaluation and Planning), Mexico, Jamaica and Germany showed that problem-orientation and interdisciplinary methodology of TA offer a promising frame to deal with cultural and ethical questions in relation to new and emerging technologies. The variety of presentations from “Science and technology for the people?” (A. Chakraborty, Chalmers University of Technology), “TA in forestry sector under climate change” (C. Scherz and S. Saha, ITAS), “Urban decentralized water, sanitation and hygiene interventions in technology assessment” (S. Ward, University of the West of England) or “Comparison of Ecosystem Services from Mixed and

work in Europe with a focus on Hungary by C. Makó and M. Illéssy (Hungarian Academy of Sciences) to an analysis of Austrian labor conflicts by P. Schörpf (FORBA) and B. Herr (University of Vienna).

What can be said at the end of such a packed conference? The TA-community is very lively. It was very inspiring to see that the community evolves in terms of content and that the debates are not only European but also international. The next TA conference will take place in Karlsruhe in 2021.

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### Further information

For members of the globalTA network see <https://globalta.technology-assessment.info>. Slides of the conference's presentations are available at <https://bratislava2019.technology-assessment.info>.